

E518: Gamma-Ray Spectroscopy of ${}^{11}_{\Lambda}\text{B}$

In E518 we have investigated precise structure of ${}^{11}_{\Lambda}\text{B}$ hypernuclei by high-resolution γ -spectroscopy technique using a large germanium detector array, Hyperball.

The experiment was performed in September and October in 2002 for the beam time of 80 shifts using the almost identical setup as that of E419. Employing the K6 beam line and SKS (Superconducting Kaon Spectrometer), bound states of ${}^{11}_{\Lambda}\text{B}$ were produced by the (π^+, K^+) reaction at 1.04 GeV/c on an enriched ${}^{11}\text{B}$ metal target, and γ rays were detected using Hyperball installed around the target.

The data analysis has been finished. We have successfully observed six γ transitions from ${}^{11}_{\Lambda}\text{B}$ as shown in Fig. 1 and their energies and relative yields were measured. In addition, lifetimes of these transitions were derived from the peak shape using Doppler shift attenuation method. The 1483 keV transition was assigned to the $E2(1/2^+ \rightarrow 5/2^+)$ transition from the lifetime (> 6 ps) and the yield. The energy of this $E2$ transition is significantly different from the value (1020 keV) predicted by a shell model calculation using the strength of the nucleon-spin-dependent ΛN interaction (S_N parameter) determined from the ${}^7_{\Lambda}\text{Li}$ data obtained in E419. It implies that more theoretical and experimental efforts are necessary to completely understand the spin-dependent ΛN forces and their effects to hypernuclear structure. The 2477 keV peak, which is observed after Doppler shift correction, is assigned to the $3/2^+; T = 1 \rightarrow 1/2^+$ transition where the $1/2^+$ state is composed of ${}^{10}\text{B}(1^+, 2154 \text{ keV}) + \Lambda$.

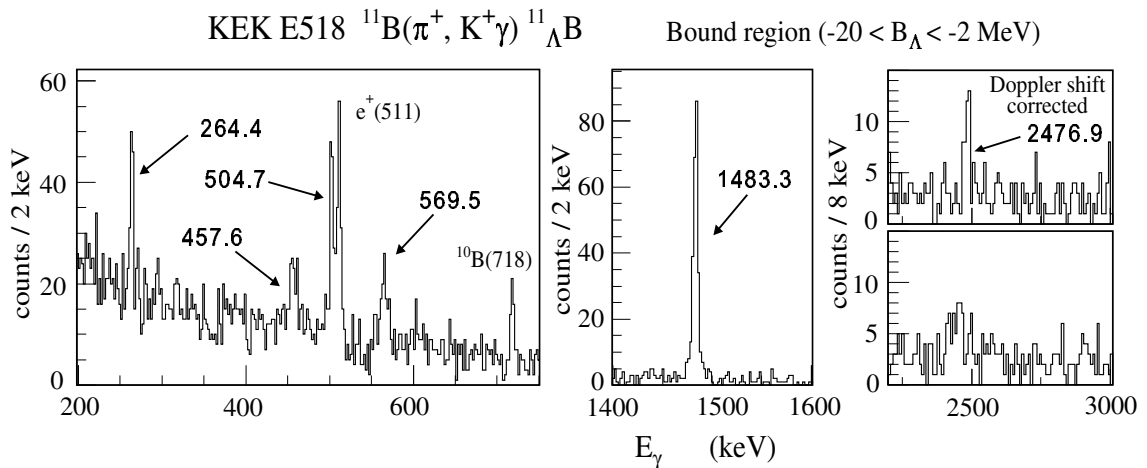


Figure 1: The γ ray spectra of ${}^{11}_{\Lambda}\text{B}$ measured in E518. Six transitions were observed.